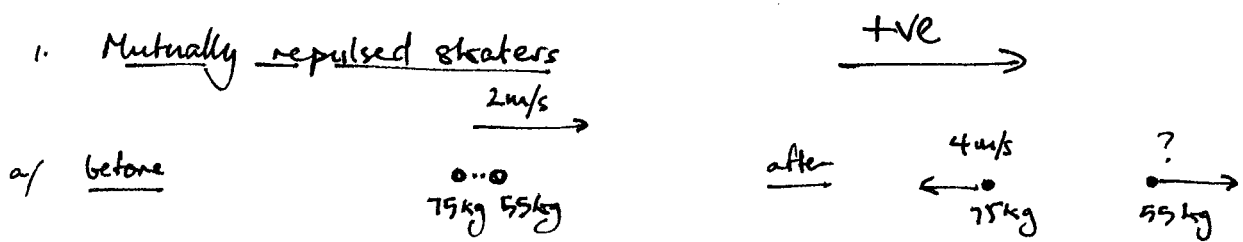


Answers to momentum questions



$$M_{(D+P)} V_{(D+P)} = M_P V_P + M_D V_D \leftarrow \text{good subscript!}$$

$$130 \times 2 = 75 \times (-4) + 55 \times V_D.$$

$$260 = (-300) + 55 V_D$$

$$V_D = \frac{560}{55}$$

$$= \underline{10.18 \text{ m/s}} \quad (\text{+ve, so in } \rightarrow)$$

(Hence 'explosions', the extra force in the push increases both speeds.)

b/ maintaining of child

As no velocity given, we can assume child starts at rest:

$$(M_P V_P + M_C V_C)_i = \overset{\rightarrow +ve}{(M_P V_P + M_C V_C)_f}$$

$$75 \times -4 + 0 = 0 + 30 \times V_C$$

$$V_C = \frac{-300}{30} = \underline{10 \text{ m/s}} \quad (\leftarrow)$$

(Remember to give direction if your answer is a velocity).

2. Wierd elk vengeance scenario

Impulse = total change in momentum.

$$Ft = m_1 v_1 - m_2 v_2 = m_1 (v_1 - v_2)$$

$$F \times 0.02 = 0.05 (1000 - (-125))$$

Note:

Mass in kg for answer
in N.

Velocity in opposite
direction - ve.

$$F = \frac{0.05 (1125)}{0.02} = \underline{\underline{2812.5 \text{ N}}}$$

3. Cat swingers of the world, unite...*

$$Ft = m(v_1 - v_2)$$

$$120 \times 0.01 = 0.5 (v_1 - 0) \quad (\text{Assume can stationary})$$

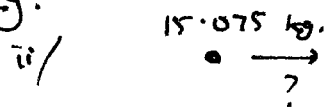
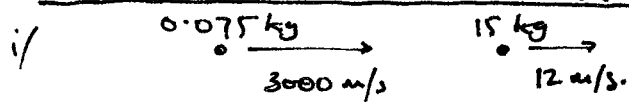
$$1.2 = 0.5 v_1 \quad v_1 = \underline{\underline{2.4 \text{ m/s.}}}$$

Note that velocity is in direction of swinging cat. No
more can be said.

Extension - Show how, by using Cole's Law, that
given the mass, length and breed of the cat, the ASV
of the lacer can be estimated. Include an estimated
error. If the cat is a 4kg Persian of 47 cm, tail to
nose, what is the overall probability that the car is Red
Stripe?

* They say there's more than one way to skin a cat. I say find
a way that works for you and practice til you're really good...

4. Pinocchio - the untold spelling.



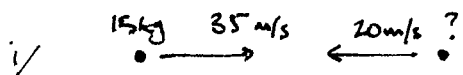
$$M_b V_b + M_p V_p = M_{bp} V_{bp}$$

$$0.075 \times 3000 + 15 \times 12 = 15.075 \times V$$

$$225 + 180 = 15.075 V$$

$$V = 26.87 \text{ m/s } (\rightarrow)$$

5. (Pin - oh - key - oh) - so what?



\longrightarrow +ve

$$M_p V_p + M_n V_n = M_{pn} V_{pn}$$

$$15 \times 35 + M_n \times -20 = (15 + M_n) \times 2$$

$$525 - 20 M_n = 30 + 2 M_n$$

$$525 - 30 = 22 M_n$$

$$M_n = \frac{495}{22} = \underline{\underline{22.5 \text{ kg}}}$$

(Obviously, it's a big number. What sort of hospital do you think he'd go to?)

6. And for those of you watching in black and white...

$$F t = m(V_1 - V_2)$$

$$35 t = 0.6(0.75 - 0)$$

$$t = \frac{0.45}{35} = \underline{\underline{0.013 \text{ s}}} \text{ (2sf)}$$

6/ 7

y/ Indeed.